

# Urban gridlock: Macroscopic modeling and mitigation approaches

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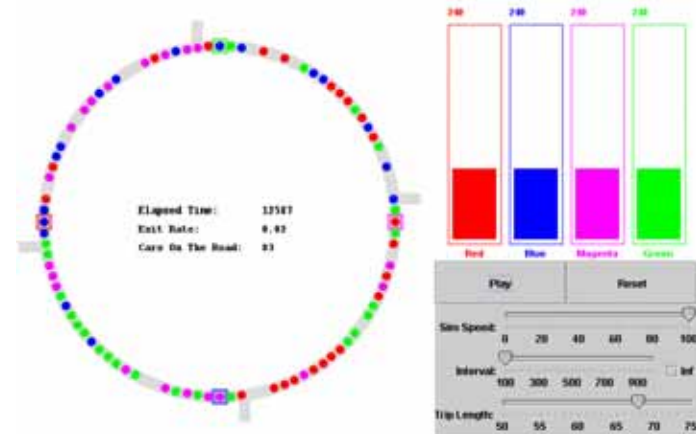
*Transportation Research Part B* (in press)

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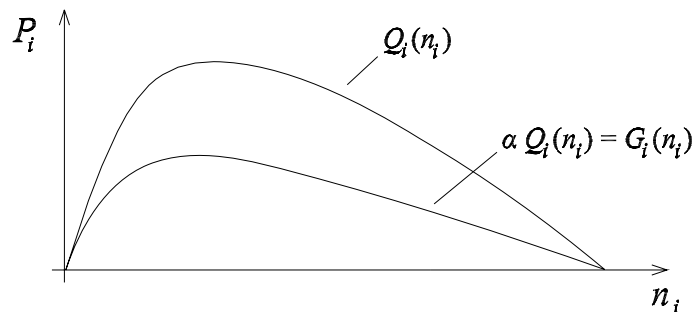
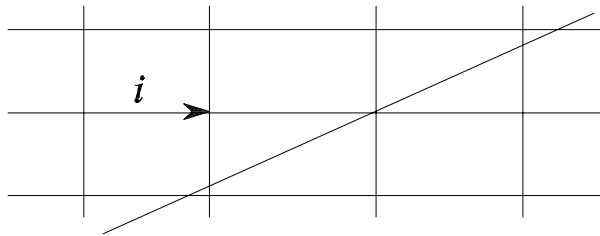


# KEY ISSUES

- MOBILITY IMPROVEMENT APPROACH  
PROPOSE→EVALUATE→IMPLEMENT
- FRAGILE EVALUATION MODELS
  - Inputs unreliable
  - Outputs unpredictable
- WHAT TO DO?
- ROBUST APPROACH  
PROPOSE→MONITOR→MODIFY
- BUT IS IT POSSIBLE?



# DEFINITIONS

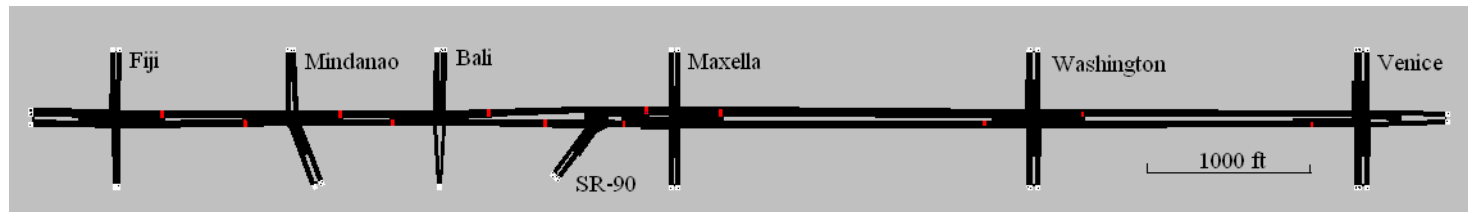


Accumulation :  $n_i$  (vehs)

Travel Production :  $P_i = n_i \cdot u_i$  (veh-km/hr)

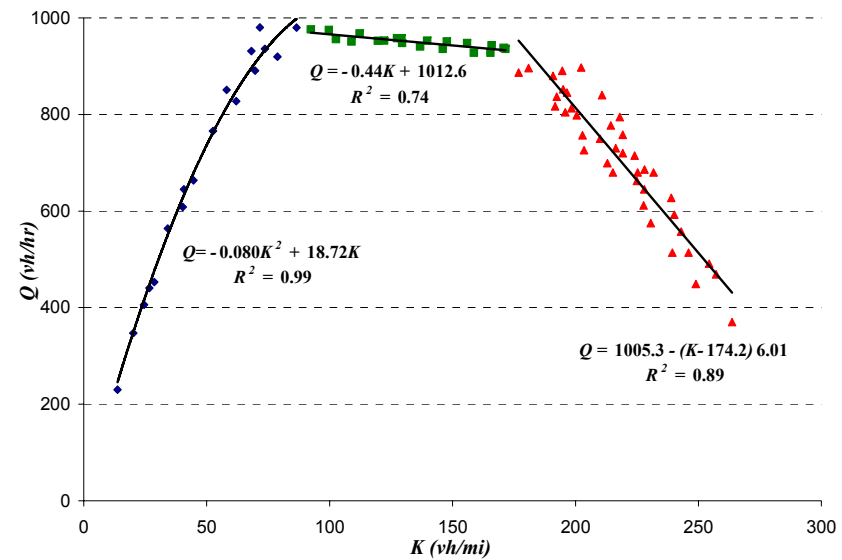
Output :  $E_i = n_i \cdot u_i \cdot \alpha_i$  (vh/hr)

# AGGREGATION HYPOTHESIS

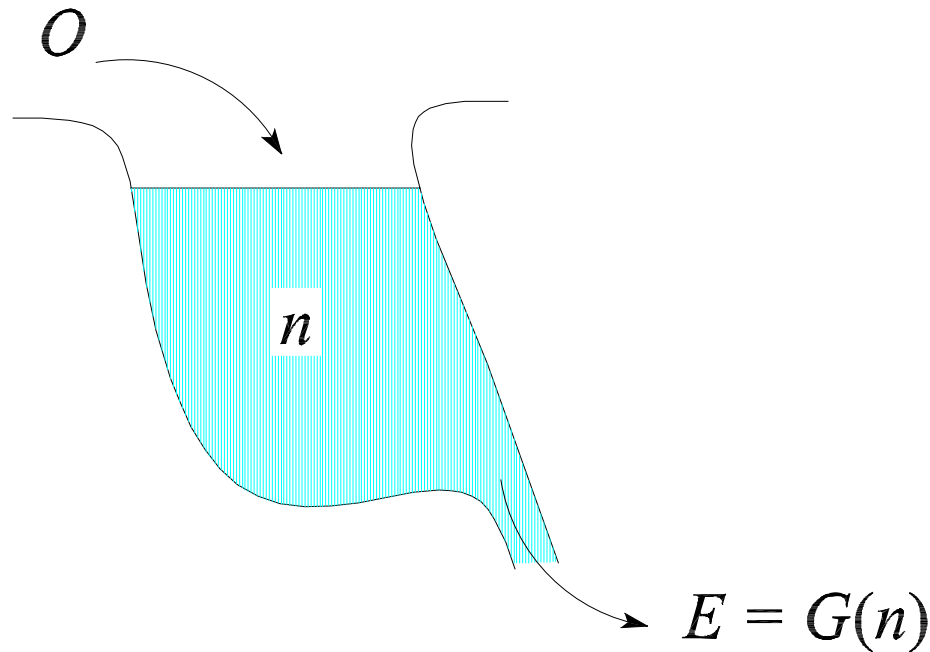


$$P \equiv \sum P_i \equiv \sum Q_i(n_i) \cong Q(\sum n_i)$$

$$E \equiv \sum E_i \equiv \sum G_i(m_i) \cong G(\sum n_i)$$



# AGGREGATE DYNAMICS



Given :  $Q, G$

Control :  $O(t)$

Monitor :  $n(t)$

Maximize :  $\int E(t)dt$

$$\frac{dn(t)}{dt} = O(t) - G(n(t))$$

POLICY :  $n^*(t) \approx n_{crit}$

# PROPERTIES OF POLICY

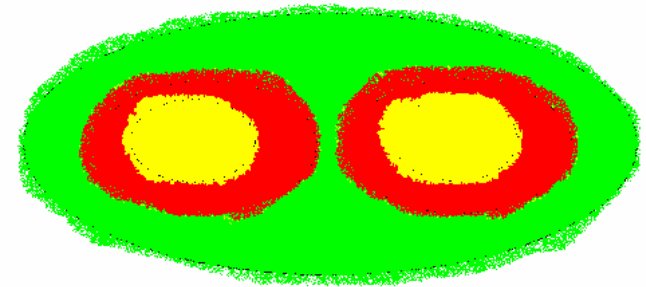
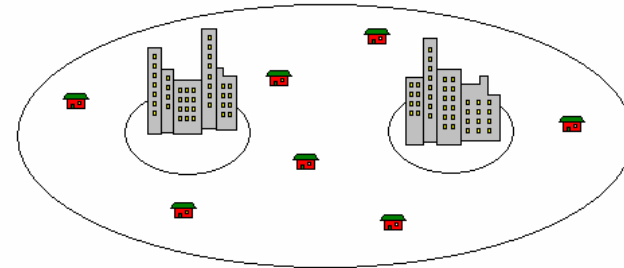
- Observable (monitor)
- Robust (no forecasts)
- Pareto Efficient



# ADDITIONAL INSIGHTS AND CONCLUSIONS

- INVARIANCE PRINCIPLE 2:  
TRAFFIC vs. DESTINATION DENSITY

- Multi-Reservoir Systems
- Multimodal principles
- Tests and deployment



# QUESTIONS



<http://www.its.berkeley.edu/volvocenter/>